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First finding of *Belgrandia marginata* (Michaud) in the Lithuanian Quaternary malacofauna

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An Atlantic mollusc *Belgrandia marginata* (Michaud) has been detected for the first time in Lithuania among the Netiesos interglacial fauna (southeastern Lithuania). Considering that this species in Poland, Belarus and Lithuanian occurs only in the malacofauna of the last (Eemian) interglacial, it is stratigraphically significant in the indicated region. The malacological investigations of the Netiesos interglacial deposits revealed the mollusc fauna richer than had been found earlier in the Merkinė interglacial fauna. Moreover, the lower part of the deposits in the section studied contained shells of periglacial molluscs, such as *Columella columella* (Martens), *Vallonia tenuilabris* (A. Braun) and *Vertigo genesii* (Gredler), which correspond to the late glacial stage of the penultimate (Medininkai or Pripyat) glaciation.

Key words: *Belgrandia marginata* (Michaud), malacofauna, Pleistocene, Merkinė Interglacial, Netiesos

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INTRODUCTION

Findings of rare shells and those unknown in a certain region, as well as other palaeontological remains, always excite the interest of specialists, since they expand the variety of species, enable to perform more detailed palaeogeographic reconstructions and, in some cases, help to stratify buried beds. *Belgrandia marginata* (Michaud) is among such findings. The present-day habitat of this western European mollusc does not reach the area of Lithuania, Belarus and East Europe. However, during the warmest interglacial of Eemian, its habitat expanded eastwards. It was detected at first in the malacofauna of Poland (Niezabitowski, 1929; Skompski, 1983) and later in Belarus (Sanko, 2004). It is natural that similar findings among the molluscs in Lithuania are also possible. The present paper discusses data of geological–palaeontological studies of the deposits in the Netiesos section, where, however, only a single shell of this species has been found yet.

The Netiesos section is of a reference type, rich in different palaeontological remains.

DESCRIPTION OF PROFILE

The interglacial deposits in the Netiesos outcrop are reckoned a parastratotype of the Merkinė Formation in the Quaternary stratigraphic scheme of Lithuania (Lithuanian stratigraphic units, Vilnius, 1999) and are observed on the right bank of the Nemunas River at the Netiesos village, about 1 km downstream of the Netiesa Brook mouth, or 3 km from Jonionys–Maksimonys and 6 km westwards of the Merkinė settlement, after which the interglacial and the formation are named. The stratotype section of the Merkinė interglacial explored at the vicinity of Jonionys–Maksimonys discloses deposits of a palaeolake on the left side of the Nemunas valley at the Jonionys village and its right side at Maksimonys (Fig. 1).

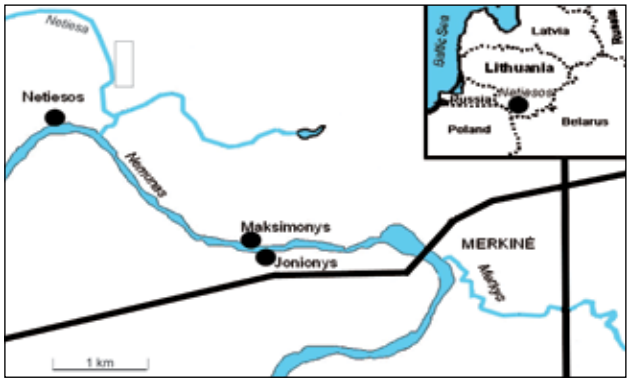

Fig. 1. Location of the investigated Netiesos section. Coordinates (longitude, latitude) – 54 02′20″; 24 05′02″

1 pav. Netiesų pjūvio vieta. Geografinės koordinatės – 54 02′20″; 24 05′02″

The interglacial deposits in the Netiesos section occur at the base of the glaciofluvial terrace of the ice marginal valley of the Nemunas River. The height of the terrace is at least 20 m. The deposits of the Netiesos palaeobasin supplement the stratotype section significantly (Кондратене, 1996). Late glacial deposits of the period preceding the Medininkai glaciation and early phase of the Merkinė interglacial, which have slightly investigated in the Jonionys–Maksimonys stratotype area, are exceptionally well represented in the Netiesos section. The interglacial strata outcropping in the Netiesos occur in the basin of very compact till boulder loam of the Medininkai glaciation. This basin was formed by the meltwater of the glacier of the same glaciation. The margin of the loam strata is marked by boulders and pebble deposits washed by meltwater from till. The petrographic analysis of the pebble fraction (in %) showed fragments of Fennoscandian crystalline rocks, sandstones including quartzite of the Jotnian age, Devonian dolomite rocks, Silurian and Ordovician grey limestone from the northern part of the Central Baltic and the islands, as well as Estonia, other types of Palaeozoic limestone of the Baltic area, Mesozoic marl and flint of the Cretaceous, mainly of local origin, and some other rocks. The board side of the till has traces of weathering that occurred during the Merkinė interglacial.

The section of the Merkinė (Eemian, Mikulino, Muravian) interglacial is represented in Netiesos by lake and bog deposits. Generally they lie in the form of lenses in a buried valley, the base of which is inside the U-shaped till of the Medininkai glaciation (Gaigalas et al., 2005).

The lower part of this thickness is concave and composed of lake sand with pebble and interlayers of sandy sapropelite. Upwards, the interglacial thickness contains organogenic sapropelites (gyttja) covered by a peat bed. The thickness of the interglacial deposits ranges from 5 to 7 m. The lake–bog interglacial deposits are covered by sand–gravel deposits, sometimes with boulders corresponding to the early, middle and late phases of the Nemunas glaciation (Gaigalas et al., 2005; Gaigalas, Fedorowicz, Melešytė, 2005). The total thickness of the cover is at least 12 meters.

To study molluscs, 12 samples were collected from the interglacial deposits in the Netiesos outcrop (Gaigalas, Fedorowicz, Melešytė, 2005).

The first sample (No. 1) was taken from the upper layer of peat (Fig. 2), the second one (No. 2) was taken from the contact of the peat and peaty sapropelite rich in molluscs, then three samples (Nos. 3–5) and two more samples (Nos. 6 and 7) were taken from sandy sapropelite, two samples (Nos. 8 and 9) from aleuritic sapropelite, whereas sand with sapropelite interlayers (No. 10), sand with aleurite and wood or mollusc detritus (No. 11) and sand with moraine lumps (No. 12) were sampled once for each case. The absolute age of the peat cover, as determined by uranium–thorium method was found to be 105.7 ± 10.0 thousand years and 108.8 ± 8.7 thousand years (Gaigalas et al., 2005). These dates were confirmed by the mollusc dating done for the same layer by ESR method (101.5 ± 11.5 thousand years) (Gaigalas, Molodkov, 2002). The age of the molluscs dated from the lower part of the interglacial section, as determined by ESR method, was 112.1 ± 25.9 thousand years (Gaigalas, Molodkov, 2002). The age of the Merkinė interglacial determined by a thermo-luminescence method ranged from 135.9 to 103.2 thousand years (Gaigalas, Fedorowicz, Melešytė, 2005).

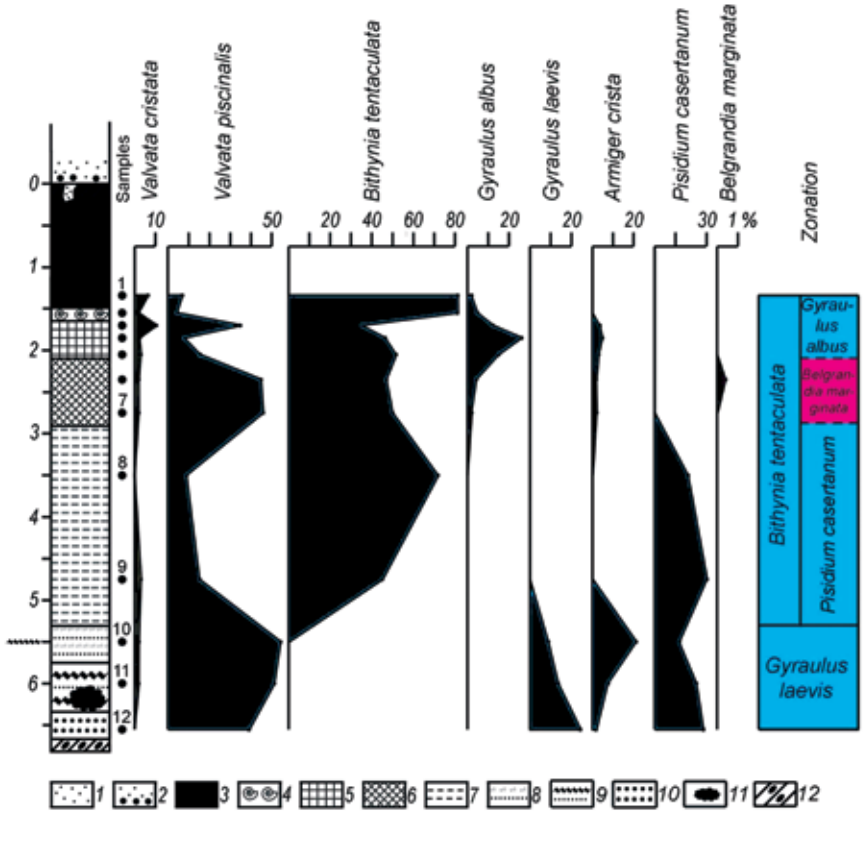

Fig. 2. Malacological diagram of lake–bog deposits in the Netiesos section.
1 – sand, *2* – sand with gravel and pebble, *3* – peat, *4* – concentration shells of mollusc, *5* – peaty sapropelite, *6* – sandy sapropelite darkly gray, *7* – silty sapropelite grey brightly, *8* – gyttja, *9* – sand with organics, *10* – sand with silt, *11* – decay peat, *12* – till

2 pav. Netiesų atodangos ežerų-pelkių nuogulų malakofaunos diagrama: *1* – smėlis, *2* – smėlis su žvirgždu ir gargždu, *3* – durpė, *4* – moliuskų geldelių sankaupa, *5* – durpingas sapropelitas, *6* – tamsiai pilkas smėlingas sapropelitas, *7* – šviesiai pilkas aleuritingas sapropelitas, *9* – smėlis su organika, *10* – smėlis su aleuritu, *12* – morena

Fig. 3. *Belgrandia marginata* (Michaud) of the Netiesos section. A view of the shell from the front and from the side
3 pav. Netiesų pjūvis, *Belgrandia marginata* (Michaud). Geldelės iš priekio ir šono

CHARACTERISATION OF SPECIES

Only one shell of *Belgrandia marginata* (Michaud) was found in the gyttja of the Netiesos section. The small size of the shell (to 1.5 mm high and 0.85 mm wide) indicates probably a young specimen (Fig. 3). The shell is conic with dim cross lines (striated). The first 1.5–2 whorls are not cross-lined (striated), with dimple texture seen at high enlargement. There are 4.5 whorls, which are convex, gradually increasing, more low than broad. Its aperture is round-oval, sometimes egg-shaped or slightly square at the top. At the outer side of the aperture there is a characteristic digitate roughness parallel to the aperture margin. E. L. Niezabitowski (1929) observed up to three such riblets on the shells taken from the Eemian deposits in Poland. Shells from the Szelong section at Poznan also had a shorter whorl; that is why the author proposed to consider it as a variety of *B. marginata polonica* Niezabitowski.

The species discussed belongs to a group of West European Atlantic molluscs. Its habitat is in the rivers of France and Catalonia (Spain). During the Pleistocene interglacials, it widened its area into the Central Europe. It was rather widely distributed in Waalian, Cromerian and Holsteinian interglacials in North-East Europe, including the Rhine basin (Meijer, Preece, 1996). During the optimum of the Eemian, the habitat of the species covered the area of Great Britain, Denmark, Germany and Poland. The regions of Belarus and Lithuanian seem to be the easternmost and northernmost margins of the habitat. In Belarus, 29 shells of this species were detected in the Muravian interglacial deposits, borehole Tl-48 near the town of Belynichi (Sanko, 2004). In Zhukevichi at Neman, as in Netiesos, only one shell of this species was found.

The history of the investigations carried out on the Netiesos section, where the interglacial relict was detected, is presented below, the site of this palaeontological finding is given, and the conditions of the formation of the deposits with molluscs are discussed from the palaeoclimatic and ecological points of view.

HISTORY OF INVESTIGATIONS ON THE MOLLUSC FAUNA

The deposits of the old basin exposed at the base a 19–20 m high terrace of the Nemunas River, about 1 km downstream from the Netiesa Brook, are well investigated. They are reliably dated as deposits of the last (Merkinė, Eemian) interglacial, as well as late glacial, according to both palaeontological (Riškiene, 1979; Кондратене, 1965; 1996; Калиновский, 1981; Величкевич, 1982; Мотузко, 1989) and geochronological studies (Гайгалас, Молодьков, 2002; Gaigalas et al., 2005; Gaigalas, Fedorowicz, Melešytė, 2005). These deposits, among few Lithuanian sections of the Pleistocene, were studied by applying a malacological method (Bremówna, Sobolewska, 1950; Кондратене, 1965; Sanko, Gaigalas, 2004).

M. Bremówna and M. Sobolewska (1950) were the first to describe the Netiesos malacofauna that (according to J. Urbanski's description) was represented by eleven taxa of freshwater molluscs mainly belonging to wide-spread lake and lake–bog species. Later, O. P. Kondratienė (Кондратене, 1965) presented the data collected by a Lithuanian malacologist P. Šivickis about the Netiesos mollusc fauna consisting of fourteen taxa. Beside the wide-spread species, Ponto-Caspian rheophyl *Valvata naticina* (Menke) and Baltic *Marstoniopsis scholtzi* (Schmidt) are mentioned. However, our investigations have not confirmed the presence of the first one. *Marstoniopsis scholtzi* (Schmidt) – a species morphologically similar to *Belgrandia marginata* (Michaud) – also has not been found. Nevertheless, it is quite possible that in this case there was a mistake made during the definition of the taxon. At different times different researchers of the Merkinė interglacial deposits in the Netiesos section and Jonionys–Maskimonys stratotype described the following species of molluscs: *Pisidium supinum* (A. Schmidt), *Valvata cristata* (Müller), *V. piscinalis* (Müller), *V. naiticina* (Menke), *V. pulchella* (Studer), *Retinella nitidula* (Draparnaud), *Succinea pfeifferi* (Rossmässler), *Anisus vortex* (Linnaeus), *Bathyomphalus contortus* (Linnaeus), *Galba truncatula* (Müller), *Pupilla muscorum* (Linnaeus), *Cochlicopa lubrica* (Müller), *Hippeutis complanatus colchicus* (Lindholm), *H. riparius* (Westerlund), *Bithynia tentaculata* (Linnaeus), *Gyraulus laevis* (Alder), *G. gredleri* (Bielz), *Segmentina nitida* (Müller), *Amnicola steini* (Martens) = *Marstoniopsis scholtzi* (Schmidt), *Lymnaea stagnalis* (Linnaeus), *Arcoloxus lacustris* (Linnaeus), *Planorbis planorbis* (Linnaeus), *Radix ovata* (Draparnaud), *Anodonta* sp., *Unio* sp., *Pisidium* sp. (Вайтекунас, 1969).

Our investigations (Sanko, Gaigalas, 2004) on the Netiesos malacofauna were related to an attempt to determine the role of *Valvata sibirica* in it. The mollusc fauna in the Netiesos section was determined to consist of 31 taxa with *Clausiliidae gen., Bithynia tentaculata* (Linnaeus), *Gyraulus albus* (Müller), and *Unioidae gen*. This fauna reflect the climatic optimum of the Merkinė interglacial. It is a good supplement to the data obtained using other palaeontological methods, although this fauna had no independent stratigraphic significance, since it did not contain characteristic representatives of the Eemian (Merkinė) malacological complex. The situation changed after a representative of the Atlantic region was determined in the malacofauna; thus, it became stratigraphically (climato-stratigraphically) significant.

The development of flora of the Merkinė Interglacial, according to the research results of the Netiesos section, has been reconstructed rather in detail (Кондратене, 1996). It is characterized by a differentiation in the forest composition. The interglacial deposits are rich in diverse fossil remains of plants (pollen and spores, seeds, fruits, megaspores, cones of conifers, wood and moss). The flora from the Netiesos section is the richest among all the floras of the Merkinė Interglacial. The first half of the Interglacial was more continental than the second. During the spell of optimal climate, the broad-leaved forests were

flourishing. During the optimal climate spell at the Merkinė Interglacial, the annual precipitation was much higher than at present in Lithuania and the average annual temperature might have been by two degrees higher.

MALACOFAUNA IN NETIESOS – 2006

Malacological investigations of the deposits from the reference section of the Lithuanian Pleistocene have been carried out in the summer of 2006 with the participation of Monika Melešytė, Sigita Budėnaitė and Rimantas Urbonavičius. Lake–bog deposits were described in their whole bed. As a result, two malacological complexes – interglacial and periglacial – corresponding to the phase of the last Middle Pleistocene glaciation have been obtained. A full list containing 37 (8 terrestrial and 29 freshwater) mollusc taxa and their distribution are given in Table.

The interglacial complex of molluscs consists, almost solely, of freshwater species. Rare terrestrial taxa (*Clausiliidae* gen., *Limacidae* gen.) allow to assume that the slopes of the bogging basin were overgrown by a forest. A good confirmation of this is the occurrence of tree remains with abundant fruits of *Carpinus betulus* L. The base of the terrestrial malacofauna in the inter-

Table**. Malacofauna from Merkinė Interglacial deposits in Netiesos – 2006 (Lithuania), specimen of a mollusc. E – ecological symbols of molluscs according to S. V. Alexandrowicz (1987)**

Lentelė. **Netiesų atodangos Merkinės tarpledynmečio nuogulų malakofauna, moliuskai vienetais. E – moliuskų ekologiniai simboliai pagal S. V. Aleksandrovičių (1987)**

E	Species	Samples											
		1	2	3	4	5	6	7	8	9	10	11	12
	Clausiliidae gen.			2									
5.1	*Columella columella* (Martens)												1
5.6.	*Pupilla* sp.												1
5.12.	*Vallonia tenuilabris* (A.Braun)												2
7.14	*Limacidae* gen.	1											
9.5.	*Vertigo genesii* (Gredler)												5
9.10.	*Succinea putris* (Linnaeus)										1		1
9.11.	*Succinea elegans* (Risso)												1
10.1	*Valvata cristata* Müller	28	10	145	10	8	2	1		1	2	2	
10.7.	*Lymnaea truncatula* (Müller)												5
10.8	*Lymnaea ex gr. peregra* (Müller)	5	2	2	2		2		1		3	4	4
10.10	*Planorbis planorbis* (Linnaeus)												
10.16	*Segmentina nitida* (Müller)			5	1		1				1	1	
10.19	*Pisidium obtusale* (Lamarck)										1	4	
11.2.	*Valvata piscinalis* (Müller)	35	24	485	80	71	113	128	5	6	228	441	140
11.2	*Valvata piscinalis antiqua* Sowerby											7	2
11.3.	*Bithynia tentaculata* (Linnaeus)	36	2	22	10	23	15	11		3			
11.3.	*Bithynia tentaculata* (Linnaeus) – operculata	400	460	475	205	125	101	129	40	15			
11.5.	*Lymnaea stagnalis* (Linnaeus)	12	18	25	1							2	
11.6.	*Lymnaea auricularia* (Linnaeus)				1	2						2	
11.9.	*Planorbarius corneus* (Linnaeus)	12	22	2									
11.11	*Anisus vortex* (Linnaeus)					1	1						
11.14	*Gyraulus albus* (Müller)	2	25	170	118	43	10	4					
11.15	*Gyraulus laevis* (Alder)										36	117	85
11.16	*Gyraulus acronicus* (Férussac)	1	2	13	4			1					
11.17	*Armiger crista* Linnaeus			50	20	10	1	2			88	67	2
11.19	*Acroloxus lacustris* (Linnaeus)			1									
11.20	*Sphaerium corneum* (Linnaeus)	4		1	1					2	2	3	1
11.22	*Pisidium milium* Held											5	5
11.23	*Pisidium subtruncatum* Malm										1	15	2
11.24	*Pisidium pulchellum* Jenyns											2	2
11.26	*Pisidium casertanum* (Poli)								9	1	50	170	80
11	*Pisidium sp.*									11			
12.4.	*Belgrandia marginata* (Michud)						1						
12.12	*Unioidae* gen.			5			2						
12.21	*Pisidium amnicum* (Müller)										2	2	14
12.24	*Pisidium nitidum* Jenyns										4	10	
	Total	536	565	1403	453	283	249	276	55	39	419	854	353

glacial is formed of such euryecological species as *Valvata piscinalis* (Müller) and *Bithynia tentaculata* (Linnaeus). *Valvata piscinalis* is a eurytopic species able to inhabit waters of glacial and interglacial basins and streams, whereas *Bithynia tentaculata* is a thermophilic, mainly interglacial species. This is well-confirmed by the distribution of the remains of both species in the section under discussion. The appearance of *Bithynia tentaculata* (Linnaeus) shells and opercula in the deposits (samples Nos. 9 and 10) indicates the beginning of their accumulation in this interval of the interglacial thickness. The malacological diagram (Fig. 2) shows the change of the climatic conditions from late glacial to interglacial in the zone where *Gyraulus laevis* is replaced by *Bithynia tentaculata*.

The freshwater fauna of the interglacial is less differentiated quantitatively. Under the lake conditions, the leading role was played by *Bithynia tentaculata* (Linnaeus) (Fig. 4). Only at the last stage of the lake and its turning into a bog, coinciding with the beginning of the climatic optimum of the Merkinė Interglacial, local optimum is formed by *Gyraulus albus* (Müller).

A single shell of *Belgrandia marginata* (Michaud) was detected in the deposits (sample No. 6) corresponding to the climatic optimum of the Merkinė Interglacial. This species appeared in the first half of the *Gyraulus albus* phase. The association of thermophilic molluscs of that time (local optimum of *Belgrandia marginata*) included some species of *Unioidae* gen., as well as *Bithynia tentaculata* (Linnaeus) and *Gyraulus albus* (Müller).

The periglacial complex of molluscs in the Netiesos section is represented by terrestrial species, such as *Columella columella* (Martens), *Vallonia tenuilabris* (A.Braun), and *Vertigo genesii* (Gredler) (Fig. 5). Such a combination characterises climatic conditions of a cool but not very cold stadial. All three species in the complex under discussion are absent in the present-day malacofauna of Lithuania.

Presently, the species *Columella columella* (Martens) has a holarctic habitat. It inhabits the mountains in Scandinavia, North Asia, Central Europe (Alps, Tatras) and North America (as far as Mexico). In Europe, it inhabits the Boreal–Alpine and Tundra belts. It is often detected in non-forest (loess) faunas in the Pleistocene of Europe and leads the so-called Columella–fauna typical of climatic conditions of the Pleistocene glaciations.

Vallonia tenuilabris (A. Braun) also belongs to the typical periglacial molluscs. It is often met in so-called loess-faunas formed during different stages of the Pleistocene glaciations. Now it dwells in Siberia, both in mountain regions and open landscapes with different humidity conditions. It is considered to be the species that has disappeared from the Russian Plain. Most probably, the distribution of this species in the late glacial regions of the Pleistocene glaciations was controlled by permafrost.

A mesophilic *Vertigo genesii* (Gredler) inhabits, as a rule, boggy areas. Its buried shells can be detected in humic and even peaty deposits. This is a Boreal–Alpine species with its habitat area forming a narrow belt on the Scandinavian mountains and discontinuous areas in the Alps and the Carpathians. It has been also met in some sites of the Central Europe. During the Pleistocene glaciations and periglacial time periods, it occupied vast areas in the European lowlands. In Poland and Belarus, this species is observed in deposits corresponding to both glacial, mainly late glacial, and early glacial (early interglacial) time spans. However, the species had not reached its optimum in the interglacials and Holocene.

The periglacial freshwater complex of the Netiesos molluscs is less impressive than the terrestrial one. It has no typical periglacial species. According to the shell parameters, it resembles the early interglacial fauna. *Gyraulus laevis* (Alder) should be recognized as a characteristic species of freshwater fauna in the Netiesos section at the time span discussed. Now it is a holarctic species, whereas in the Pleistocene it was a representative of unstable, mainly periglacial environments, and often appeared in the beginning stage of lake formation. During the transitive phases, the species was distributed in great numbers and was met, as a rule, together with *Armiger crista* (Linnaeus), *Lymnaea peregra* (Müller), *Valvata piscinalis* (Müller) and *Sphaerium corneum* (Linnaeus). Such a combination of the Netiesos lacustrine fauna is a facies analogue of the forest terrestrial fauna with *Columella columella* (Martens) and other cryophilic molluscs (cf. Sparks, West, 1968). In Poland, *Gyraulus laevis* (Alder) is a characteristic representative of loess mollusc associations (Alexandrowicz, 1995).

Fig.4. Representatives of interglacial molluscs in the Netiesos section: on the left – cover of *Bithynia tentaculata* (Linnaeus), on the right – shell of *Gyraulus albus* (Müller)

4 pav. Tarpledynmečio malakofaunos atstovai Netiesų atodangoje. Kairėje pusėje – *Bithynia tentaculata* (Linnaeus) dangtelis, dešinėje pusėje – *Gyraulus albus* (Müller) kriauklė

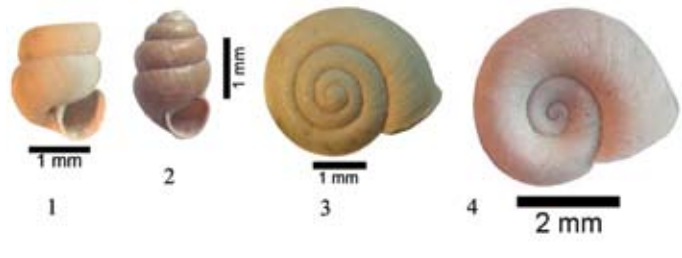

Fig. 5. Representatives of the periglacial molluscs in the Netiesos section. *1 – Columella columella* (Martens), *2 – Vertigo genesii* (Gredler), *3 – Vallonia tenuilabris* (A. Braun), *4 – Gyraulus laevis* (Alder)

5 pav. Periglacialinės faunos atstovai Netiesų atodangoje: *1 – Columella columella* (Martens), *2 – Vertigo genesii* (Gredler), *3 – Vallonia tenuilabris* (A. Braun), *4 – Gyraulus laevis* (Alder)

CONCLUSIONS

Two approaches – palaeoclimatic and stratigraphic – were applied to study the species of *Belgrandia marginata* (Michaud).

The palaeoclimatic significance of the species is due to its relationship with optimal climatic conditions of the last interglacial in Poland, Belarus and Lithuania. According to A. A. Velichko (Величко, 1973), the climatic optimum of the Mikulino interglacial on the Russian Plain corresponded to the most extreme climatic indices for the whole Pleistocene. This conclusion recently is more and more often confirmed. According to S. Skompski (1983), the spread of *B. marginata* (Michaud) northwards during the Polish Eemian was limited by the July isotherm of 18 °C. On the other hand, the penetration of the Atlantic mollusc far eastwards witnesses the significant influence of the Atlantic marine climate during the last (Eemian) interglacial. This influence, most probably, was stronger than that during the Holocene optimum or at present time.

The stratigraphic or, to be more precise, climato-stratigraphic role of the species under discussion in the area of Poland, Belarus and Lithuania is, first of all, related to its double peculiarity as a migrant species and an interglacial relict. *B. marginata* (Michaud) appeared here in the Pleistocene malacofauna only once, during the warmest Eemian (Merkinė) Interglacial, and it was not observed in any other Pleistocene malacofauna in the region. All this defines its climato-stratigraphic role. It should be noted that in the Western Europe, where *B. marginata* (Michaud) is observed in malacofaunas of several interglaciations, its climato-stratigraphic role is weaker.

The occurrence of *B. marginata* (Michaud) in the Netiesos malacofauna enables to single out the deposits corresponding to the climatic optimum of the last interglacial. In order to divide the deposits in the section according to the malacofaunal data, the whole complex of molluscs should also be taken into account. Based on these arguments, the malacofaunal phases should be compared to the palaeoclimatic units as follows below. The phase of *Gyraulus laevis* (sand with organic and mineral gyttja inclusions, layers Nos. 9 and 8, Fig. 2) corresponds to late glacial (Loyev) strata of the penultimate (Medininkai, Pripyat) glaciation. The phase of *Bithynia tentaculata* comprises the deposits of the Merkinė (Eemian, Muravino) interglacial. The early subdivision of this phase (zone) – the subphase of *Pisidium casertanum* (layer No. 7 of light-grey gyttja) – corresponds to the early interglacial, whereas the subphase (subzone) of *Belgrandia marginata* and *Gyraulus albus* corresponds to the optimum of the Merkinė interglacial in Lithuania.

The findings of fossil shells *Belgrandia marginata* (Michaud) in Poland, Belarus and Lithuania enabled to perform a stratigraphic correlation of deposits in the region independent of their type and facies variety. Presently, the deposits from all the seven sites of faunal finding are well inter-correlated (Fig. 6). We suppose that the new findings of *B. marginata* (Michaud) will not cause difficulties to perform stratigraphic identification of deposits.

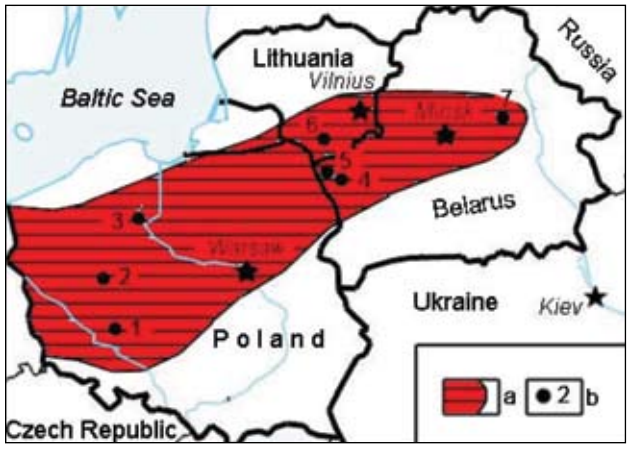

Fig. 6. Distribution of *Belgrandia marginata* (Michaud) in Poland, Belarus and Lithuania during the Eemian Interglacial: *1* – Žmigród, *2* – Szeląg, *3* – Brachlewo, *4* – Zhukevichi, *5* – Rumlovka, *6* – Netiesos, *7* – Belynichi (*a* – distribution area of species, *b* – locations)

6 pav. *Belgrandia marginata* (Michaud) paplitimas Lenkijoje, Baltarusijoje ir Lietuvoje: *1* – Žmigród, *2* – Szeląg, *3* – Brachlewo, *4* – Zhukevichi, *5* – Rumlovka, *6* – Netiesos, *7* – Belynichi (*a* – rūšies paplitimo plotas, *b* – radimvietės)

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BELGRANDIA MARGINATA (MICHAUD) – PIRMASIS RADINYS LIETUVOS KVARTERO MOLIUSKŲ FAUNOJE

S a n t r a u k a

Netiesų atodangoje (Pietryčių Lietuva) tarpledynmečio faunoje pirmą kartą kvartero periodo nuogulose surastas atlantinio klimato moliuskas *Belgrandia marginata* (Michaud). *B. marginata* (Michaud), kuris tarp malakofaunos atstovų pasirodė vieną kartą Merkinės (Eemio) tarpledynmečio šilčiausio laikotarpio metu. Jis nepastebėtas tarp kitos pleistoceno malakofaunos Lietuvoje. Taigi galima teigti, kad ši moliuskų rūšis turi klimatostratigrafinę reikšmę. Vakarų Europoje *B. marginata* moliuskų rūšis pasitaiko keliuose tarpledynmečiuose ir ten jos klimatostratigrafinė reikšmė menkesnė. Lenkijoje, Baltarusijoje ir Lietuvoje šios rūšies moliuskai yra būdingi paskutiniam (Eemio) tarpledynmečiui, todėl šiame regione jie yra svarbūs stratigrafiškai. Tarp Netiesų malakofaunos surastas moliuskas *B. marginata* (Michaud) padeda išskirti Merkinės tarpledynmečio klimato optimumo nuogulas. Tirto Netiesų nuogulų pjūvio suskirstymui taip pat yra svarbus periglacialinių moliuskų kompleksas. Tuo remiantis, malakofaunos zonas galima sugretinti su keliais paleoklimato padaliniais. *Gyraulus laevis* zona atitinka priešpaskutinio (Medininkų, Pripetės) apledėjimo vėlyvojo ledynmečio sluoksnius (smėlis su organikos intarpais ir mineralinė gitija). *Bithynia tentaculata* paplitusi Merkinės (Eemio, Muravos) tarpledynmečio nuogulose. Ankstesnis šios zonos suskirstymas – *Pisidium casertanum* subzona (šviesiai pilka gitija) – atitinka tarpledynmečio ankstyvą laikotarpį, o *Belgrandia marginata* ir *Gyraulus albus* – Merkinės tarpledynmečio Lietuvoje klimato optimumą. Ištyrus Netiesų atodangos nuogulų malakofauną, nustatyta turtingesnė negu anksčiau Merkinės tarpledynmečio moliuskų sudėtis. Tyrinėto pjūvio apatinėje dalyje surastos kriauklės periglacialinių moliuskų *Columella columella* (Martens), *Vallonia tenuilabris* (A.Braun), *Vertigo genesii* (Gredler), kurie veisėsi priešpaskutinio (Medininkų, Pripetės) apledėjimo vėlyvojo ledynmečio metu. Lenkijoje, Baltarusijoje ir Lietuvoje rastos *Belgrandia marginata* (Michaud) kriauklių fosilijos leido atlikti stratigrafines koreliacijas nepriklausomai nuo nuogulų tipo ir facinės sudėties.

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ПЕРВАЯ НАХОДКА *BELGRANDIA MARGINATA* (MICHAUD) В ЧЕТВЕРТИЧНОЙ ФАУНЕ МОЛЛЮСКОВ ЛИТВЫ

Р е з ю м е

В межледниковой фауне Нятесос (юго-восток Литвы) впервые для четвертичного периода Литвы отмечен атлантический моллюск *Belgrandia marginata* (Michaud). Вид *B. marginata* (Michaud) появлялся в малакофауне однажды, в течение самого теплого мяркинского (еэмского) интергляциала и не был отмечен ни в какой другой малакофауне плейстоцена рассматриваемого региона. Это и определяет его климатостратиграфическую роль. Следует отметить, что в странах Западной Европы, где вид *B. marginata* (Michaud) известен в малакофаунах нескольких интергляциалов, его климатостратиграфическое значение снижается. Судя по тому, что вид встречается в Польше, Беларуси и Литве только в малакофаунах последнего (еэмского) межледниковья, он обладает стратиграфическим значением в указанном регионе. Присутствие *B. marginata* (Michaud) в малакофауне Нятесос дает основание для выделения отложений, соответствующих климатическому оптимуму последнего межледниковья. Для расчленения отложений разреза по малакофаунистическим данным значение имеет также перигляциальный комплекс моллюсков. Исходя из этих аргументов, малакофаунистические фазы (зоны) необходимо сопоставить со следующими палеоклиматическими единицами. Фаза (зона) *Gyraulus laevis* (песок с включением органики и минеральная гиттия) отвечает позднеледниковым слоям предпоследнего (мядининкайского, припятского) оледенения. Фаза *Bithynia tentaculata* охватывает отложения мяркинского (еэмского, муравинского) межледниковья. Раннее подразделение этой фазы – подфаза (светло-серая гиттия) – соответствует раннемежледниковью, а подфазы *Belgrandia marginata* и *Gyraulus albus* – оптимуму мяркинского межледниковья Литвы. При малакологическом изучении межледниковых отложений в Нятесос выявлена более богатая, чем ранее, фауна моллюсков мяркинского межледниковья. Кроме того, в нижней части отложений разреза обнаружены раковины перигляциальных моллюсков *Columella columella* (Martens), *Vallonia tenuilabris* (A. Braun), *Vertigo genesii* (Gredler), отвечающие позднеледниковой фазе развития предпоследнего (мядининкайского, припятского) оледенения. Находки ископаемых раковин *Belgrandia marginata* (Michaud) в Польше, Беларуси и Литве позволяют проводить стратиграфические корреляции отложений в регионе вне зависимости от их типа и фациальной разнородности.